REMARKS

Pending Claims

Applicants have amended claims 1, 5, 8 and 9 to delete the limitations thereof directed to the mounting of the semiconductor device by second soldering. The mounting of the semiconductor device by second soldering has been included in new dependent claims 32-35, which respectively depend from the amended independent claims. Accordingly, claims 1, 3, 5-14 and 32-35 are pending.

Interview Summary Record and Discussion of Art Rejections

Applicants extend their appreciation to the Examiner for granting an Office Interview to discuss the rejections in the outstanding Office Action. At the interview, data of the modulus of elasticity for typical silicone resins was presented, which was excerpted from the Silicone Material Handbook for Use in Electric - Electronic Industry, August, 1991, published by Toray Silicone Co., section 8.4, (translated into English and referred to herein as Handbook), copy enclosed. The Handbook data shows characteristics of silicone molding compounds, which become silicone resins after

curing. Included in the table of data are values of the modulus of elasticity of the compounds, which are "measured after curing", which means after the silicon compound has cured and become a silicon resin (see footnote 1 on page 5 of the Handbook excerpt). As shown, the typical values for modulus of elasticity for the silicone resins is outside the range claimed by Applicants

In particular, it was discussed in the interview that the Handbook data shows typical modulus of elasticity values for silicone resins used for encapsulation. Consideration of the data requires units conversion from kg/cm^2 to MPa. In this regard, Applicants note that 1 kg/cm^2 can be expressed as 1.0×10^5 Pa. In applying this conversion, for example, for "SH304" the value from the Handbook for the modulus of elasticity is 1.1×10^5 kg/cm^2, which is 1.1×10^4 MPa. Applicants also note that the data of the Handbook presents measurements taken at room temperature or 25°C. Although silicone resin has a glass transition temperature of -50° C at which the modulus of elasticity changes abruptly, the modulus of elasticity of silicone resin is substantially constant over

the temperature range of 25°C (room temperature) to over 150°C.

Typical values of the modulus of elasticity for silicone resins, as taken from the Handbook, are not within the range of 1 MPa to 200 MPa at a temperature of 150°C or more or of 200 MPa or more at a temperature of 25°C, as claimed. As a result, it is respectfully asserted that the claimed range of modulus of elasticity values is not an inherent property of silicon resins.

Although the Handbook presents data relating to the modulus of elasticity of silicone resins, the Moriyama reference also mentions epoxy resins (see col. 3, lines 47-49 of Moriyama), which are also claimed. Accordingly, Applicants refer the Examiner to the data provided in the specification regarding the modulus of elasticity of typical epoxy resins. See page 19, line 23 to page 20, line 2 and Fig. 5, for example. As shown in Fig. 5, curves "B", "C", "D" show low elastic epoxy resins having the modulus of elasticity within the claimed range that are suitable for the present invention as compared with existent high elasticity epoxy resin "T", which is not suitable.

There is no disclosure in the art of record that suggests an elastic insulative resin of silicone or epoxy that has a range of modulus of elasticity that is claimed by Applicants. Rather, Applicants have presented data that shows typical silicone and epoxy resins that have modulus of elasticity values outside the ranges claimed by Applicants. Applicants have determined that by using a low elasticity resin having a modulus of elasticity of 1 to 200 MPa at a temperature of 150° or of 200 MPa or more at a temperature of 25°C, the pressure caused by the melting expansion of the solder can be moderated and as a result the occurrence of short circuits between the connection terminals in the surface mounted parts can be avoided. By showing the typical values of modulus of elasticity for silicone resins in the Handbook and providing comparative data for typical epoxy resins in Fig. 5 of the present application, the prima facie case of obviousness is overcome and therefore the 35 USC § 103 rejections based on Moriyama should be withdrawn.

Specifically, it is recognized in the Office Action that Moriyama does not explicitly teach the claimed elastic insulative (silicone or epoxy) resin having a modulus of

elasticity of 1 - 200 MPa at a temperature of 150°C or of 200 MPa or more at a temperature of 25°C. However, the differences between Moriyama et al and the claimed invention are not obvious to one having ordinary skill in the art. Further, none of Ishida et al, Zakel et al and Wolf et al suggest to one having ordinary skill in the art the claimed elastic insulative resin set forth in each of the independent claims. Accordingly, the rejections under 35 U.S.C. § 103 should be withdrawn.

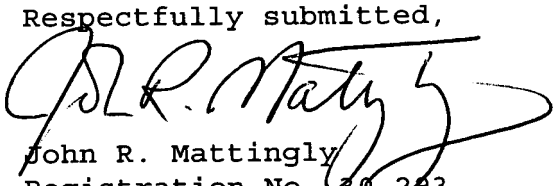
New Claims

The Examiner was advised in the Interview that the claims would be amended to remove the limitation added in the previous amendment that is directed to the mounting of the semiconductor device by secondary soldering. Dependent claims 32-35 have been added that set forth the mounting of the semiconductor device on a second substrate by secondary soldering and these claims should be found to be allowable at least for respectively depending from allowable base claims.

Conclusion

In view of the foregoing amendments and remarks, reconsideration and reexamination are respectfully requested.

Respectfully submitted,



John R. Mattingly
Registration No. 30,293
Attorney for Applicants

MATTINGLY, STANGER & MALUR
1800 Diagonal Rd., Suite 370
Alexandria, Virginia 22314
(703) 684-1120
Date: July 19, 2004

Data Sheet

Silicone Material Handbook for Use in Electric - Electronic Industry

Published:

August 1981, first print ; July 1983, third print
May 1982, second print; June 1984, fourth print

Edited and published from Toray Silicone Co.
2-8, Nihonbashi Muro-machi, Chuo-ku, Tokyo
Mitsui Building No. 6
03(246)1641

8.4 Molding compound (MC)

Characteristics before molding

Class	Silicone molding compound							Silicone epoxy molding compound	
Name of product	SH304	SH305	SH306	SH307	SH308	PRX908	MC6412	MC6450	MC6455
Standard color	black	black	black, gray, green, blue	gray	gray	black	black, gray, green, blue	black, green	black
Shape	granular, tablet	granular, tablet	granular, tablet	granular, tablet	granular, tablet	granular, tablet	granular, tablet	granular, tablet	granular, tablet
Bulk coefficient	2	2	2	2	2	2	2	2	2
Filler	silica	silica	silica + glass fiber	silica + glass fiber	silica + glass fiber	silica + glass fiber	silica + glass fiber	silica + glass fiber	silica
Shelf life (month) 5°C/23°C	3/1	3/1	3/1	3/1	3/1	3/1	3/1	4/1	4/1

Typical transfer molding condition and molding characteristics

Class	Silicone molding compound							Silicone epoxy molding compound	
Name of product	SH304	SH305	SH306	SH307	SH308	PRX908	MC6412	MC6450	MC6455
Molding temperature (°C)	160-180	160-180	160-180	160-180	160-180	160-180	160-180	160-180	160-180
Injection pressure (kg/cm^2)	>30	>30	>30	>40	>30	>35	>30	>30	>30
Molding time (min)	1-3	1-2	1-3	1.5-5	1-2.5	1-2.5	1-3	1-2.5	1-2.5
Post cure (hr/°C)	2/200	2/200	2/200	2/200	2/200	-	2/200	6～12/175	6～12/175
* Spiral flow (inch)	6-15	15-25	35-50	20-30	25-40	25-35	25-40	20-40	20-40
* Flow time (sec)	10-20	10-20	15-25	15-25	10-20	15-25	25-30	15-20	10-20
Molding shrinkage (%)	0.67	0.68	0.39	0.39	0.39	0.40	0.39	0.49	0.50
** Shrinkage after post cure (%)	0.67	0.68	0.29	0.21	0.21	-	0.3	0.43	0.40

* 175°C, 56kg/cm^2, Hull spiral mold (MC6450, PRX908, and MC6455: 70kg/cm^2, 175°C)

** Post cure: 200°C for 1 hr (MC6450, MC6455: 175°C for 12 hr)

Characteristics of molding products (1)

Class	Silicone molding compound							Silicone epoxy molding compound	
Name of product	SH304	SH305	SH306	SH307	SH308	PRX908	MC6412	MC6450	MC6455
Specific gravity	1.86	1.86	1.87	1.87	1.87	1.94	1.92	1.85	1.92
Bending strength (kg/cm^2)	530	500	600	550	610	680	670	950	1000
Bending modulus of elasticity (kg/cm^2)	1.1×10^5	1.1×10^5	1.1×10^5	0.7×10^5	0.9×10^5	1.5×10^5	-	1.3×10^5	1.5×10^5
Compressive strength (kg/cm^2)	1360	1120	950	710	840	1100	1200	2200	2200
Izot impact strength ($kg \cdot cm/cm^2$)	1.5	1.5	1.5	1.3	1.3	1.8	1.7	1.8	2.0
Water absorption (%) 2)	0.08	0.08	0.10	0.10	0.10	0.10	0.04	-	-
Rockwell hardness (M scale)	90	95	80	70	80	-	88	-	110
Combustibility (UL94) 3)	V-O	V-O	V-O	V-O	V-O	V-O	V-O	V-O	V-O
Thermal deformation temperature (℃)	>300	>300	>300	>300	>300	>300	>300	>300	>300
Coefficient of linear expansion (cm/cm/(℃) 4)	3.7×10^{-5}	4×10^{-5}	3.2×10^{-5}	3.2×10^{-5}	3.2×10^{-5}	2.8×10^{-5}	3.0×10^{-5}	2.8×10^{-5}	2.4×10^{-5}
Heat conductivity (cal/cm・sec・℃)	0.9×10^{-3}	1.1×10^{-3}	1.2×10^{-3}	1.3×10^{-3}	1.2×10^{-3}	1.3×10^{-3}	1.2×10^{-3}	1.4×10^{-3}	1.7×10^{-3}
Radiation resistance (Mrad)	2000	2000	2000	2000	2000	-	-	-	-

Arc resistance (sec)	300	310	240	230	250	250	290	180	180
Dielectric breakdown strength (kV/mm), in oil	15	15	15	15	15	15	15	15	15
Dielectric constant: 10^6Hz									
normal state	3.5	3.5	3.8	3.8	3.8	4.1	3.7	3.7	3.7
After water immersion 2)	3.6	3.6	3.9	3.9	3.9	4.2	3.7	-	-
Dielectric loss tangent: 10^6Hz									
normal state	0.002	0.002	0.002	0.002	0.002	0.004	0.002	0.004	0.004
After water immersion 2)	0.002	0.002	0.003	0.003	0.003	0.005	0.002	-	-
Volume resistivity (Ω・cm)									
normal state	2×1015	2×1015	2×1015	2×1015	2×1015	2×1015	2×1015	2×1016	2×1016
After water immersion 2)	1×1015	1×1015	1×1015	1×1015	1×1015	1×1015	-	-	-
Glass-transition temperature (°C)	-	-	-	-	-	-	-	165	165

1) After post cure at 200°C for 2 hrs (no post cure for PRX 908)

2) After immersing in purified water (25°C) for 24 hrs

3) SH304, SH305; test result by our company

4) Measuring temperature range: room temperature to 150°C